Baker Hughes

Rewriting The Energy Equation™

Case study: Northern Territory, Australia

PERFLEX HPWBM/PYRO-DRILL system sets ROP record of 1,100 m/day in challenging HP/HT wells

An Australian operator required a highperformance water-based mud (HPWBM) to drill three appraisal wells in batch drilling mode. The drilling operation was challenged by problematic formations, high pressure (the offset well's maximum MW was 13.2 ppg [1.58 sg]), static bottomhole temperature (BHT) of up to 300°F (149°C), and a 3,000-m (9,843-ft) horizontal section. On previous wells, these conditions resulted in unstable mud properties, stuck pipe, loss of the bottomhole assembly (BHA), and slower rates of penetration (ROPs). The operator needed an economicalm solution to convert an HPWBM into a high-pressure/high-temperature (HP/HT) WBM to ensure wellbore stability, maximize ROP, and drill to target depth (TD) in less than 25 days.

Baker Hughes proposed its proven **PERFLEX™ high-performance waterbased drilling fluid system** to drill the intermediate section (12 ¼-in. hole). The **MAX-GUARD™ PLUS A shale stabilizer** and polyglycol were added to the active system at 2% by volume to inhibit hydration and swelling of the formation, prevent balling, and improve ROP.

The drilling operation commenced with the PERFLEX system. When the BHT reached 248°F (120°C), the system was converted to a **PYRO-DRILL™ HP/HT high-performance water-based drilling fluid system.** High-temperature products including the **PYRO-VIS™ II viscosifier/filtration control additive, PYRO-TROL™ II and KEM-SEAL™ filtration control additives,** and **ALLTEMP™ thinner/deflocculant** were added to maintain mud properties and prevent gelation at high temperatures. Due to high pressures while drilling the 8 ½-in. section, the PYRO-DRILL system was weighted up to 12.7 ppg (1.52 sg). **TEQ-LUBE™ 673 lubricant** was added to the system at 2-4% by volume to mitigate torque and drag tendencies. The mud properties and drilling parameters were closely monitored at the rig site to ensure that the mud stayed within its optimal formulation range.

The PYRO-DRILL drilling fluid helped drill all three appraisal wells smoothly, safely, and ahead of schedule, resulting in cost savings for the client. The fluid maintained its properties in the lateral section, unlike other fluids in previous wells.

The wellbore remained in good condition throughout drilling and trip out in the HP/HT section. No wiper trips were required.

Casings ran smoothly and faster than previously in all sections on all wells.

This application, the operator's first deployment of the Baker Hughes PYRO-DRILL HP/HT HPWBM fluid system in the Northern Territory, avoided the hole problems faced during the 2024 drilling campaign. The combined PERFLEX/PYRO-DRILL fluid system offering delivered superior performance with no recorded nonproductive time (NPT), HSE incidents, or hole instability.

This successful drilling operation attracted new investments and opportunities to use the drilling fluid system in future campaigns in the region.

Challenges

- Environmentally sensitive area
- Wellbore instability with lost BHA previously due to differential sticking
- High bottomhole temperatures (>295°F (>146°C))
- Limited rig tank capacity leading to high mud temperature at surface
- Complicated logistics due to remoteness of the drill site

Results

- Efficiently and cost-effectively converted high-performance WBM system to high-pressure/high-temperature WBM system
- Successfully used a 12.7-ppg (1.52-sg) PYRO-DRILL system in the 8 ½-in. section with no bit balling, hole problems, gelation, or barite sag
- Maintained mud properties throughout drilling, tripping, and casing runs, with no wiper trips required
- Set ROP record for basin – drilled 1,100 m (3,609 ft)/day
- Reached TD ahead of plan and 2.5 days faster than previous campaign
- Avoided all NPT and HSE incidents